

NUCLEAR REGULATORY COMMISSION

10 CFR Part 72

RIN 3150-AG93

Geological and Seismological Characteristics for Siting and Design of Dry Cask Independent  
Spent Fuel Storage Installations and Monitored Retrievable Storage Installations

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Proposed rule.

**SUMMARY:** The Nuclear Regulatory Commission (NRC) is proposing to amend its licensing requirements for dry cask modes of storage of spent nuclear fuel, high-level radioactive waste, and power reactor-related Greater than Class C waste in an independent spent fuel storage installation (ISFSI) or in a U.S. Department of Energy (DOE) monitored retrievable storage installation (MRS). These amendments would update the seismic siting and design criteria, including geologic, seismic, and earthquake engineering considerations. The proposed rule would allow NRC and its licensees to benefit from experience gained in the licensing of existing facilities and to incorporate the rapid advancements in the earth sciences and earthquake engineering. The proposed amendments would make the Part 72 regulations compatible with the 1996 revision to Part 100 that addressed uncertainties in seismic hazard analysis, and commensurate with the risk associated with an ISFSI or MRS.

**DATES:** The comment period expires **(insert date 75 days after date of publication)**.

Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

**ADDRESSES:** Submit comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff.

Deliver comments to 11555 Rockville Pike, Rockville, Maryland, between 7:30 a.m. and 4:15 p.m. on Federal workdays.

You may also provide electronic comments via the NRC's interactive rulemaking website at (<http://ruleforum.llnl.gov>). This site provides the capability to upload comments as files (any format), if your web browser supports that function. For information about the interactive rulemaking website, contact Ms. Carol Gallagher at (301) 415-5905, or e-mail [cag@nrc.gov](mailto:cag@nrc.gov).

Certain documents related to this rulemaking, including comments received, may be examined at the NRC Public Document Room (PDR), Room O-1F21, 11555 Rockville Pike, Rockville, MD. These same documents may also be viewed and downloaded electronically via the rulemaking website.

The NRC maintains an Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. These documents may be accessed through the NRC's Public Electronic Reading Room on the Internet at <http://www.nrc.gov/reading-rm/adams.html>. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's PDR reference staff at 1-800-397-4209, 301-415-4737, or by email to [pdr@nrc.gov](mailto:pdr@nrc.gov).

**FOR FURTHER INFORMATION CONTACT:** Keith K. McDaniel, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone: (301) 415-5252, e-mail: [kkm@nrc.gov](mailto:kkm@nrc.gov).

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## **I. Background**

In 1980, the Commission added 10 CFR Part 72 to its regulations to establish licensing requirements for the independent storage of spent nuclear fuel and high-level radioactive waste (HLW) (45 FR 74693; November 12, 1980). In 1988, the Commission amended Part 72 to provide for licensing the storage of spent nuclear fuel and HLW in an MRS (53 FR 31651, August 19, 1988). Subpart E of Part 72 contains siting evaluation factors that must be investigated and assessed with respect to the siting of an ISFSI or MRS, including a requirement for evaluation of geological and seismological characteristics. ISFSI and MRS facilities are designed and constructed for the interim storage of spent nuclear fuel that has aged for at least one year, and other solidified high-level radioactive materials that are pending shipment to a high-level radioactive waste repository or other disposal.

The original regulations envisioned ISFSI and MRS facilities as spent fuel pools or single, massive dry storage structures. The regulations required seismic evaluations equivalent to those for a nuclear power plant (NPP) when the ISFSI or MRS is located west of the Rocky Mountain Front (west of approximately 104° west longitude), referred to hereafter as western U.S., or in areas of known seismic activity east of the Rocky Mountain Front (east of approximately 104° west longitude), referred to hereafter as eastern U.S. A seismic design requirement, equivalent to the requirements for a NPP (Appendix A to Part 100) seemed appropriate for these types of facilities, given the potential accident scenarios. For those sites located in eastern U.S., and not in areas of known seismic activity, the regulations allowed for less stringent alternatives.

For other types of ISFSI or MRS designs, the regulation required a site-specific investigation to establish site suitability commensurate with the specific requirements of the

proposed ISFSI or MRS. The Commission explained that for ISFSIs that do not involve massive structures, such as dry storage casks and canisters, the required design earthquake ground motion (DE) will be determined on a case-by-case basis until more experience is gained with the licensing of these types of units (45 FR 74697).

For sites located in either the western U.S. or in areas of known seismic activity in the eastern U.S., the regulations in 10 CFR Part 72 currently require the use of the procedures in Appendix A to Part 100 for determining the design basis vibratory ground motion at a site. Appendix A requires the use of “deterministic” approaches in the development of a single set of earthquake sources. The applicant develops for each source a postulated earthquake to be used to determine the ground motion that can affect the site, locates the postulated earthquake according to prescribed rules, and then calculates ground motions at the site. Because the deterministic approach does not explicitly recognize uncertainties in geoscience parameters, probabilistic seismic hazard analysis (PSHA) methods were developed that allow explicit expressions for the uncertainty in ground motion estimates and provide a means for assessing sensitivity to various parameters.

Advances in the sciences of seismology and geology, along with the occurrence of some licensing issues not foreseen in the development of Appendix A to Part 100, have caused a number of difficulties in the application of this regulation to ISFSIs. Specific problematic areas include the following:

1. The limitations in data and geologic and seismic analyses and the rapid accumulation of knowledge in the geosciences have required considerable latitude in judgment. The inclusion of detailed geoscience assessments in Appendix A has caused difficulties for applicants and the NRC staff by inhibiting the use of needed judgment and flexibility in applying basic principles to new situations. Requiring the use of Appendix A has also

inhibited the use of evolving methods of analyses (for instance, probabilistic) in the licensing process; and

2. Various sections of Appendix A are subject to different interpretations. For example, there have been differences of opinion and differing interpretations among experts as to the largest earthquakes to be considered and ground motion models to be used, thus often making the licensing process less predictable.

In 1996, the Commission amended 10 CFR Parts 50 and 100 to update the criteria used in decisions regarding NPP siting, including geologic and seismic engineering considerations for future NPPs (61 FR 65157; December 11, 1996). The amendments added a new § 100.23 requiring that the uncertainties associated with the determination of the safe shutdown earthquake ground motion (SSE) be addressed through an appropriate analysis, such as a PSHA or suitable sensitivity analyses in lieu of Appendix A to Part 100. This approach takes into account the problematic areas identified above in the earlier siting requirements and is based on developments in the field over the past two decades. Further, regulatory guides have been used to address implementation issues. For example, the Commission provided guidance for NPP license applicants in Regulatory Guide 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," and Standard Review Plan NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Reactors," Section 2.5.2, "Vibratory Ground Motion," Revision 3. However, the Commission left Appendix A to Part 100 in place to preserve the licensing basis for existing plants and confined the applicability of § 100.23 to new NPPs.

With over 10 years of experience licensing dry cask storage (10 specific licenses have been issued), the Commission is now proposing a conforming change to 10 CFR Part 72 to require applicants, at some locations, to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, for determining the DE. The use of a probabilistic approach or suitable sensitivity analyses to siting parallels the change made to 10 CFR Part 100.

In comparison with a NPP, an operating dry cask ISFSI or MRS facility, storing spent nuclear fuel, is a passive facility in which the primary activities are waste receipt, handling, and storage. An ISFSI or MRS facility does not have the variety and complexity of active systems necessary to support safe operations at a NPP. Further, the robust cask design required for non-seismic considerations (e.g., drop event, shielding), assure low probabilities of failure from seismic events. In the unlikely occurrence of a radiological release as a result of a seismic event, the radiological consequences to workers and the public are significantly lower in comparison to a NPP. This is because the conditions required for release and dispersal of significant quantities of radioactive material, such as high temperatures or pressures, are not present in an ISFSI or MRS. This is primarily due to the low heat-generation rate of spent fuel that has undergone more than one year of decay before storage in an ISFSI or MRS, and to the low inventory of volatile radioactive materials readily available for release to the environment. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. Short-lived volatile nuclides, such as I-131, are no longer present in aged spent fuel. Furthermore, even if the short-lived nuclides were present during a fuel assembly rupture, the canister surrounding the fuel assemblies is designed to confine these nuclides. Hence, the Commission believes that the seismically induced risk from the operation of an ISFSI or MRS is less than at an operating NPP. Therefore, the

Commission proposes to revise the DE requirements for ISFSI and MRS facilities from the current Part 72 requirements, which are equivalent to the SSE for a NPP.

## **II. Objectives**

An ISFSI is designed, constructed, and operated under a Part 72 specific or general license. A Part 72 specific license for an ISFSI is issued to a named person upon application filed under Part 72 regulations. A Part 72 general license for an ISFSI is issued under 10 CFR 72.210 to persons authorized to possess a NPP license under Part 50, without filing a Part 72 license application. A general licensee is required to meet the conditions specified in Subpart K of Part 72. An MRS may be designed, constructed, and operated by DOE under a Part 72 specific license.

The proposed rule reflects changes that are intended to (1) benefit from the experience gained in applying the existing regulation and from research; and (2) provide needed regulatory flexibility to incorporate into licensing under Part 72, state-of-the-art improvements in the geosciences and earthquake engineering.

The objectives of this proposed rule are to:

1. Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a NPP, to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, for determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or suitable sensitivity analyses to



address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation. (§ 72.103)

2. Allow new ISFSI or MRS applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI or MRS (§ 72.103); and

3. Require general licensees to evaluate that the designs of cask storage pads and areas adequately account for dynamic loads, in addition to static loads. (§ 72.212)

### **III. Applicability**

This section clarifies the applicability of the proposed new § 72.103 for Part 72 specific licensees, and modified § 72.212(b)(2)(i)(B) for Part 72 general licensees.

#### **Applicability of Proposed § 72.103**

(1) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a NPP, would be required to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, for determining the DE.

(2) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and co-located with a NPP, would have the option of addressing uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, or using the existing design criteria for the NPP, for determining the DE. When the existing design criteria for the NPP are used for an ISFSI at a site with multiple NPPs, the criteria for the most recent NPP must be used.

(3) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in the eastern U.S., except in areas of known seismic activity, would have the option of addressing uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, or using the standardized DE described by an appropriate response spectrum anchored at 0.25 g (subject to the conditions in proposed § 72.103(a)(1)), or using the existing design criteria for the most recent NPP (if applicable), for determining the DE.

(4) The proposed § 72.103 is not applicable to a general licensee at an existing NPP operating an ISFSI under a Part 72 general license anywhere in the U.S.

The proposed changes apply to the design basis of both a dry cask storage type ISFSI and MRS, because these facilities are similar in design. The Commission does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to wet modes of storage because the risk associated with potential accident scenarios for wet modes of storage is greater than the risk for dry cask modes of storage. This is because wet modes of storage require active systems, such as systems to remove heat and maintain adequate water levels. These active systems have a higher probability of failure than the passive systems used in dry cask modes of storage, thus resulting in a greater seismic risk for wet modes of storage. The Commission also does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to dry modes of storage that do not use casks because of the lack of experience gained in licensing these facilities.

Applicability of Modified § 72.212(b)(2)(i)(B)

The proposed changes in § 72.212(b)(2)(i)(B) regarding the evaluation of dynamic loads for the design of cask storage pads and areas would apply to all general licensees for an ISFSI.

The applicability of the proposed § 72.103 and modified § 72.212(b)(2)(i)(B) is summarized in the table below.

SUMMARY OF APPLICABILITY

Design Earthquake Ground Motion for ISFSI or MRS Specific License Applicants for Dry Cask Modes of Storage on or after the Effective Date of the Final Rule	
Site Condition	Specific License <sup>1</sup>
Western U.S., or areas of known seismic activity in the eastern U.S., <b>not</b> co-located with NPP	Must use PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations <sup>2</sup>
Western U.S., or areas of known seismic activity in the eastern U.S., <b>and</b> co-located with NPP	PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations <sup>2</sup> , <b>or</b> existing NPP design criteria (multi-unit sites - use the most recent criteria)
Eastern U.S., and not in areas of known seismic activity	PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations <sup>2</sup> , <b>or</b> existing NPP design criteria, if applicable (multi-unit sites - use the most recent criteria), <b>or</b> an appropriate response spectrum anchored at 0.25g (subject to the conditions in proposed § 72.103(a)(1)).

1. Proposed § 72.103 does not apply to general licensees. General licensees must satisfy the conditions given in 10 CFR 72.212.

2. Regardless of the results of the investigations, anywhere in the continental U.S., the DE must have a value for the horizontal ground motion of no less than 0.10 g with the appropriate response spectrum.

## **IV. Discussion**

The Commission is proposing to amend certain sections of Part 72 dealing with seismic siting and design criteria for a dry cask ISFSI or MRS. The Commission intends to leave the present § 72.102 in place to preserve the ISFSI licensing bases for applications before the effective date of the rule, and continue the present ISFSI or MRS licensing bases for applications for other than dry cask modes of storage. The Commission is proposing to change the heading of § 72.102, add a new § 72.103, and modify § 72.212(b)(2)(i)(B).

### **A. Proposed Change to 10 CFR 72.102**

The heading of § 72.102 would be changed to clarify that the present requirements are applicable to ISFSI or MRS licensees or license applicants before the effective date of the rule. The requirements of § 72.102 that applied to ISFSI or MRS licensees or license applicants for other than dry cask modes of storage would continue to apply.

### **B. Proposed 10 CFR 72.103**

Proposed § 72.103 describes the seismic requirements for new specific license applicants for dry cask storage at an ISFSI or MRS.

#### **1. Remove Detailed Guidance from the Regulation.**

Part 72 currently requires license applicants for an ISFSI or MRS, in the western U.S. or in other areas of known seismicity, to comply with Appendix A to Part 100. Appendix A contains both requirements and guidance on how to satisfy those requirements. For example, Section IV, "Required Investigations," of Appendix A states that investigations are required for vibratory ground motion, surface faulting, and seismically induced floods and water waves.

Appendix A then provides detailed guidance on what constitutes an acceptable investigation. A similar situation exists in Section V, "Seismic and Geologic Design Bases," of Appendix A to Part 100.

Geoscience assessments require considerable latitude in judgment because of (a) limitations in data; (b) current state-of-the-art of geologic and seismic analyses; (c) rapid accumulation of knowledge; and (d) evolution in geoscience concepts. The Commission recognized the need for latitude in judgment when it amended Part 100 in 1996.

However, specifying geoscience assessments in detail in a regulation has created difficulty for applicants and the NRC staff by inhibiting needed latitude in judgment. It has inhibited the flexibility needed in applying basic principles to new situations and the use of evolving methods of analyses (for instance, probabilistic) in the licensing process.

The Commission proposes to add a new section in Part 72 that would provide specific siting requirements for an ISFSI or MRS instead of referencing another part of the regulations (Appendix A to Part 100). The proposed regulation would also reduce the level of detail by placing only basic requirements in the rule and providing the details on methods acceptable for meeting the requirements in an accompanying guidance document. Thus, the proposed regulation contains requirements to:

- (i) determine the geological, seismological, and engineering characteristics of the proposed site;

- (ii) establish a DE; and

- (iii) identify the uncertainties associated with these requirements. Detailed guidance on the procedures acceptable to the NRC for meeting the requirements would be provided in a draft regulatory guide being issued for public comment as DG-3021, "Site Evaluations and

## Determination of Design Earthquake Ground Motion for Seismic Design of Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations.”

### 2. Address Uncertainties and Use Probabilistic Methods.

The existing approach for determining a DE for an ISFSI or MRS, embodied in Appendix A to Part 100, relies on a "deterministic" approach. Using this deterministic approach, an applicant develops a single set of earthquake sources, develops for each source a postulated earthquake to be used as the source of ground motion that can affect the site, locates the postulated earthquake according to prescribed rules, and then calculates ground motions at the site.

Although this approach has worked reasonably well for the past several decades in the sense that SSE for NPPs sited with this approach are judged to be suitably conservative, the approach has not explicitly recognized uncertainties in geosciences parameters. Because so little is known about earthquake phenomena (especially in the eastern U.S.), there have often been differences of opinion and differing interpretations among experts as to the largest earthquakes to be considered and ground-motion models to be used, often making the licensing process less predictable.

Probabilistic methods that have been developed in the past 15 to 20 years for evaluation of seismic safety of nuclear facilities allow explicit incorporation of different models for zonation, earthquake size, ground motion, and other parameters. The advantage of using these probabilistic methods is their ability to incorporate different models and data sets, thereby providing an explicit expression for the uncertainty in the ground motion estimates and a means of assessing sensitivity to various input parameters. The western and eastern U.S. have fundamentally different tectonic environments and histories of tectonic deformation.

Consequently, application of these probabilistic methodologies has revealed the need to vary the fundamental PSHA methodology depending on the tectonic environment of the site.

In 1996, when the Commission accepted the use of a PSHA methodology or suitable sensitivity analyses in § 100.23, it recognized that the uncertainties in seismological and geological information must be formally evaluated and appropriately accommodated in the determination of the SSE for seismic design of NPPs. The Commission further recognized that the nature of uncertainty and the appropriate approach to account for it depends on the tectonic environment of the site and on properly characterizing parameters input to the PSHA or suitable sensitivity analyses. Consequently, methods other than probabilistic methods, such as sensitivity analyses, may be adequate for some sites to account for uncertainties. The Commission believes that certain new applicants for ISFSI or MRS licenses, as described in Section III, “Applicability,” above, must use probabilistic methods or other sensitivity analyses to account for these uncertainties instead of using the Appendix A to Part 100. The Commission does not intend to require new ISFSI or MRS applicants that are co-located with a NPP to address uncertainties because the criteria used to evaluate existing NPPs are considered to be adequate for ISFSIs, in that the criteria have been determined to be safe for NPP licensing, and the seismically induced risk of an ISFSI or MRS is significantly lower than that of a NPP, as described in Section IV.

The key elements of the Commission’s proposed approach for seismic and geologic siting for ISFSI or MRS license review and approval consists of:

- a. Conducting site-specific and regional geoscience investigations;
- b. Setting the target exceedance probability commensurate with the level of risk associated with an ISFSI or MRS;

- c. Conducting PSHA and determining ground motion level corresponding to the target exceedance probability;
- d. Determining if other sources of information change the available probabilistic results or data for the site; and
- e. Determining site-specific spectral shape, and scaling this shape to the ground motion level determined above.

In addition, the NRC staff will review the application using all available data including insights and information from previous licensing experience. Thus, the proposed approach requires thorough regional and site-specific geoscience investigations. Results of the regional and site-specific investigations must be considered in applying the probabilistic method. Two current probabilistic methods are the NRC- sponsored study conducted by Lawrence Livermore National Laboratory and the Electric Power Research Institute's seismic hazard study. These are essentially regional studies. The regional and site-specific investigations provide detailed information to update the database of the hazard methodology to make the probabilistic analysis site-specific.

Applicants must also incorporate local site geological factors, such as stratigraphy and topography, and account for site-specific geotechnical properties in establishing the DE. Guidelines to incorporate local site factors and advances in ground motion attenuation models, and to determine ground motion estimates, are outlined in NUREG-0800, Section 2.5.2.

Methods acceptable to the NRC for implementing the proposed regulation related to the PSHA or suitable sensitivity analyses are described in DG-3021.



### 3. Revise the Design Earthquake Ground Motion.

The present DE is based on the requirements contained in 10 CFR Part 100 for NPPs. In the Statement of Considerations accompanying the initial Part 72 rulemaking, the Commission recognized that the design peak horizontal acceleration for structures, systems, and components (SSCs) need not be as high as for a NPP and should be determined on a “case-by-case” basis until “more experience is gained with licensing of these types of units” (45 FR 74697; November 12, 1980). With over 10 years of experience in licensing dry cask storage and with analyses demonstrating robust behavior of dry cask storage systems (DCSSs) in accident scenarios (10 specific licenses have been issued and 9 locations use the general license provisions), the Commission now has a reasonable basis to consider lower and more appropriate DE parameters for a dry cask ISFSI or MRS. Therefore, the Commission proposes to reduce the DE for new ISFSI or MRS license applicants to be commensurate with the lower risk associated with these facilities.

- I. Factors that result in the lower radiological risk at an ISFSI or MRS compared to a NPP include the following:
  - a. In comparison with a NPP, an operating ISFSI or MRS is a passive facility in which the primary activities are waste receipt, handling, and storage. An ISFSI or MRS does not have the variety and complexity of active systems necessary to support an operating NPP. After the spent fuel is in place, an ISFSI or MRS is essentially a static operation.
  - b. During normal operations, the conditions required for the release and dispersal of significant quantities of radioactive materials are not present. There are no high temperatures or pressures present during normal operations or under

design basis accident conditions to cause the release and dispersal of radioactive materials. This is primarily due to the low heat-generation rate of spent fuel that has undergone more than one year of decay before storage in an ISFSI or MRS, and to the low inventory of volatile radioactive materials readily available for release to the environment.

- c. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. Short-lived volatile nuclides, such as I-131, are no longer present in aged spent fuel. Furthermore, even if the short-lived nuclides were present during a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the Commission believes that the seismically induced radiological risk associated with an ISFSI or MRS is significantly less than the risk associated with a NPP. Also, the Commission has stated that the use of risk-informed regulation is appropriate.
- d. The critical element for protection against radiation release is the sealed cask containing the spent fuel assemblies. The standards in Part 72 Subparts E "Siting Evaluation Factors," and F "General Design Criteria," ensure that the dry cask storage designs are very rugged and robust. The casks must maintain structural integrity during a variety of postulated non-seismic events, including cask drops, tip-over, and wind driven missile impacts. These non-seismic events challenge cask integrity significantly more than seismic events. Therefore, the casks are expected to have substantial design margins to withstand forces from a seismic event greater than the design earthquake.

- e. During a seismic event at an ISFSI or MRS, a cask may slide if lateral seismic forces are greater than the frictional resistance between the cask and the concrete pad. The sliding and resulting displacements are computed by the applicant to demonstrate that the casks, which are spaced to satisfy the thermal criteria in Part 72 Subpart F, are precluded from impacting other adjacent casks. Furthermore, the NRC staff guidance in reviewing cask designs is to show that public health and safety is maintained during a postulated DE. This can be demonstrated by showing that either casks are designed to prevent sliding or tip over during a seismic event, or the consequences of the calculated cask movements are acceptable. Even if the casks slide or tip over and then impact other casks or the pad during a seismic event significantly greater than the proposed DE, there are adequate design margins to ensure that the casks maintain their structural integrity.
- f. The combined probability of the occurrence of a seismic event and operational failure that leads to a radiological release is much smaller than the individual probabilities of either of these events. This is because the handling building and crane are used for only a fraction of the licensed period of an ISFSI or MRS and for only a few casks at a time. Additionally, dry cask ISFSIs are expected to handle only sealed casks and not individual fuel assemblies. Therefore, the risk of a potential release of radioactivity due to failure of the cask handling building and/or crane during a seismic event is small.

II Additional rationale for reducing the DE for new ISFSI or MRS license applicants include the following:

- a. Because the DE is a smooth broad-band spectrum, which envelops the controlling earthquake responses, the vibratory ground motion specified is conservative.
- b. The crane used for lifting the casks in the building is designed using the same industry codes as for a NPP (ACI 349, AISC N690, ANSI N14.6, and NUREG-0612), and has a safety factor of five (5) or greater for lifted loads using the ultimate strength of the materials. Therefore, the crane would perform satisfactorily during an earthquake much larger than the design earthquake.
- c. The determination of a DE for an ISFSI or MRS is consistent with the design approach used in DOE Standard DOE-STD-1020, "Natural Phenomena Hazards Design Evaluation Criteria for Department of Energy Facilities," for similar type facilities.

The present DE (equivalent to the SSE for a NPP) has a mean annual probability of exceedance of approximately  $1.0\text{E-}04$  (i.e., in any one year, the probability is one in ten thousand that the DE established for the site will be exceeded). DG-3021 recommends a mean annual probability of exceedance. The Commission is soliciting public comments on the appropriate mean annual probability of exceedance, as discussed in Section VII of the SUPPLEMENTARY INFORMATION.

C. Proposed Change to 10 CFR 72.212(b)(2)(i)(B).

The Commission is proposing to modify § 72.212(b)(2)(i)(B) to require that general licensees evaluate dynamic loads, in addition to static loads, in the design of cask storage pads and areas for ISFSIs to ensure that casks are not placed in unanalyzed conditions.

During a seismic event, the cask storage pads and areas experience dynamic loads in addition to static loads. The dynamic loads depend on the interaction of the casks, cask storage pads, and areas. Consideration of the dynamic loads of the stored casks, in addition to the static loads, for the design of the cask storage pads and areas, would ensure that the cask storage pads and areas would perform satisfactorily during a seismic event.

The proposed revision would also require consideration of potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion. Depending on the properties of soil and structures, the free-field earthquake acceleration input loads may be amplified at the top of the storage pad. These amplified acceleration input values must be bound by the design bases seismic acceleration values for the cask, specified in the Certificate of Compliance. Liquefaction of the soil and instability during a vibratory motion due to an earthquake event may affect the cask stability.

The proposed changes to § 72.212 would not actually impose new burden on the general licensees because they currently need to consider dynamic loads to meet the requirements in § 72.212(b)(2)(i)(A). Section 72.212(b)(2)(i)(A) requires that general licensees perform written evaluations to meet conditions set forth in the cask Certificate of Compliance (CoC). These CoCs require that dynamic loads, such as seismic and tornado loads, be evaluated to meet the cask design bases. Specific licensees are currently required, under § 72.122(b)(2), to design ISFSIs to withstand the effects of dynamic loads, such as earthquakes and tornados.

## **V. Related Regulatory Guide**

The NRC is developing a new regulatory guide, a draft of which has been issued as developed DG-3021, "Site Evaluations and Determination of Design Earthquake Ground Motion for Seismic Design of Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations." This guide is being developed to provide license applicants with the necessary guidance for implementing the proposed regulation. DG-3021 is being developed to provide general guidance and recommendations, describes acceptable procedures and provides a list of references that present acceptable methodologies to identify and characterize capable tectonic sources and seismogenic sources. Section IV.B of this SUPPLEMENTARY INFORMATION describes the key elements.

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In the future editorial changes to NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," and NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," would be made. For example, the standard review plans would need to reference the proposed § 72.103 and the effective version of the draft guide, DG-3021.

## **VI. Discussion of Proposed Amendments by Section**

This proposed rule would make the following changes to 10 CFR Part 72:

Section 72.9 Information collection requirements: OMB approval.

In Section 72.9, the list of sections where approved information collection requirements appear is amended to add Section 72.103.

Section 72.102 Geological and seismological characteristics. (current heading)

Section 72.102 Geological and seismological characteristics for applications before [insert Effective Date of the Rule] and applications for other than dry cask modes of storage.  
(proposed new heading)

The heading of § 72.102 is proposed to be revised because § 72.103 is added for ISFSI or MRS applications after the effective date of the rule. Section 72.103 would only apply to dry cask modes of storage. Therefore, the heading of § 72.102 is being modified to show the revised applicability of this section. The requirements of § 72.102 would continue to apply for an ISFSI or MRS using wet modes of storage or dry modes of storage that do not use casks.

The Commission does not intend for existing Part 72 licensees to re-evaluate the geological and seismological characteristics for siting and design using the revised criteria in the proposed changes to the regulations. These existing facilities are considered safe because the criteria used in their evaluation have been determined to be safe for NPP licensing, and the seismically induced risk of an ISFSI or MRS is significantly lower than that of a NPP. The proposed change leaves the current § 72.102 in place to preserve the licensing bases of present ISFSIs.

Section 72.103 Geological and seismological characteristics for applications for dry cask modes of storage on or after **[insert Effective Date of the Rule]**.

The trend towards dry cask storage has resulted in the need for applicants for new licenses to request exemptions from § 72.102(f)(1), which requires that for sites evaluated under the criteria of Appendix A to Part 100, the DE must be equivalent to the SSE for a NPP. By making § 72.102 applicable only to existing ISFSIs and by providing a new § 72.103, the proposed rule is intended to preclude the need for exemption requests from new license applicants.

The proposed requirements in § 72.103 parallel the requirements in § 72.102. However, new applicants for sites located in either the western U.S. or in the eastern U.S. in areas of known seismic activity, and not co-located with a NPP, for dry cask storage applications, on or after the effective date of this rule, would be required to address the uncertainties in seismic hazard analysis by using a PSHA or sensitivity analyses instead of using the deterministic methods of Appendix A to Part 100 without sensitivity analyses. Applicants located in either the western U.S. or in areas of known seismic activity in eastern U.S., and co-located with a NPP, have the option of using the proposed PSHA methodology or suitable sensitivity analyses for determining the DE, or using the existing design criteria for the NPP. This proposed change to require an understanding of the uncertainties in the determination of the DE would make the regulations compatible with 10 CFR 100.23 for NPPs and would allow the geological and seismological criteria for an ISFSI or MRS dry cask storage facilities to be risk-informed.

Proposed § 72.103(a)(1) would provide that sites located in eastern U.S. and not in areas of known seismic activity, would be acceptable if the results from onsite foundation and geological investigation, literature review, and regional geological reconnaissance show no



unstable geological characteristics, soil stability problems, or potential for vibratory ground motion at the site in excess of an appropriate response spectrum anchored at 0.2 g. Section 72.103(a)(1) would parallel the requirements currently included in § 72.102(a)(1).

Proposed § 72.103(a)(2) would provide that applicants conducting evaluations in accordance with § 72.103(a)(1) may use a standardized DE described by an appropriate response spectrum anchored at 0.25 g. These requirements parallel the requirements currently included in § 72.102(a)(2). Section 72.102(a)(2) provides an alternative to determine a site-specific DE using the criteria and level of investigations required by Appendix A to Part 100. Proposed § 72.103(a)(2) would also provide, as an alternative, that a site-specific DE may be determined by using the criteria and level of investigations in proposed § 72.103(f). Section 72.103(f) is a new provision that would require certain new ISFSI or MRS license applicants to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, in determining the DE instead of the current deterministic approach in Appendix A to Part 100.

Proposed § 72.103(a)(2) would also provide that if an ISFSI or MRS is located at a NPP site, the existing geological and seismological design criteria for the NPP may be used instead of PSHA techniques or suitable sensitivity analysis because the risk due to a seismic event at an ISFSI or MRS is less than that of a NPP. If the existing design criteria for the NPP is used and the site has multiple NPPs, then the criteria for the most recent NPP must be used to ensure that the seismic design criteria used is based on the latest seismic hazard information at the site.

Proposed § 72.103(b) would provide that applicants for licenses for sites located in either the western U.S. or in the eastern U.S. in areas of known seismic activity, must investigate the geological, seismological, and engineering characteristics of the site using the

PSHA techniques or suitable sensitivity analysis of proposed § 72.103(f). If an ISFSI or MRS is located at a NPP site, the existing geological and seismological design criteria for the NPP may be used instead of PSHA techniques or suitable sensitivity analysis because the risk due to a seismic event at an ISFSI or MRS is less than that of a NPP. If the existing design criteria for the NPP is used and the site has multiple NPPs, then the criteria for the most recent NPP must be used to ensure that the seismic design criteria used is based on the latest seismic hazard information at the site.

Proposed § 72.103(c) is identical to § 72.102(c). Proposed § 72.103(c) would require that sites, other than bedrock sites, must be evaluated for the liquefaction potential or other soil instability due to vibratory ground motion. This is to ensure that ISFSI or MRS would be adequately supported on a stable foundation during a seismic event.

Proposed § 72.103(d) is identical to § 72.102(d). Proposed § 72.103(d) would require that site specific investigation and laboratory analysis must show that soil conditions are adequate for the proposed foundation loading. This is to ensure that ISFSI or MRS would be adequately supported on a stable foundation during a seismic event.

Proposed § 72.103(e) is identical to § 72.102(e). Proposed § 72.103(e) would require that in an evaluation of alternative sites, those which require a minimum of engineered provisions to correct site deficiencies are preferred, and that sites with unstable geologic characteristics should be avoided. This is to ensure that sites with minimum deficiencies are selected and that ISFSI or MRS would be adequately supported on a stable foundation during a seismic event.

Proposed § 72.103(f) would describe the steps required for seismic hazard analysis to determine the DE for use in the design of structures, systems, and components of an ISFSI or MRS. The proposed scope of site investigations to determine the geological, seismological,

and engineering characteristics of a site and its environs is similar to § 100.23 requirements. Unlike § 72.102(f), which requires that for sites that have been evaluated under the criteria of Appendix A to Part 100 the DE must be equivalent to the SSE for a NPP, proposed § 72.103(f) requires evaluating uncertainty in seismic hazard analysis by using a PSHA or suitable sensitivity analyses, similar to 10 CFR 100.23 requirements for a NPP.

Proposed § 72.103(f)(1) would require that the geological, seismological, and engineering characteristics of a site and its environs must be investigated in sufficient scope and detail to permit an adequate evaluation of the proposed site and to determine the DE. These requirements track existing requirements in § 100.23(c).

Proposed §§ 72.103(f)(2)(i) through (iv) would specify criteria for determining the DE for the site, the potential for surface tectonic and nontectonic deformations, the design basis for seismically induced floods and water waves, and other design conditions. In particular, § 72.103(f)(2)(i) would provide that a license applicant must address uncertainties in seismic hazard analysis by using appropriate analyses, such as, a PSHA or suitable sensitivity analyses, for determining the DE. Sections 72.103(f)(2)(ii) through (iv) track the corresponding requirements in § 100.23(d).

Finally, the proposed § 72.103(f)(3) would provide that regardless of the results of the investigations anywhere in the continental U.S., the DE must have a value for the horizontal ground motion of no less than 0.10 g with the appropriate response spectrum. This provision would be identical to the requirement currently included in § 72.102(f)(2).

#### Section 72.212 Conditions of general license issued under § 72.210.

Section 72.212(b)(2)(i)(B) would be revised to require general licensees to address the dynamic loads of the stored casks in addition to the static loads. The requirements would be

changed because during a seismic event the cask experiences dynamic inertia loads in addition to the static loads, which are supported by the concrete pad. The dynamic loads depend on the interaction of the casks, the pad, and the foundation. Consideration of the dynamic loads, in addition to the static loads, of the stored casks would ensure that the pad would perform satisfactorily during a seismic event.

The proposed new paragraph would also require consideration of potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion. Depending on the properties of soil and structures, the free-field earthquake acceleration input loads may be amplified at the top of the storage pad. These amplified acceleration input values must be bound by the design bases seismic acceleration values for the cask, specified in the Certificate of Compliance. Liquefaction of the soil and instability during a vibratory motion due to an earthquake event may affect the cask stability, and thus must be addressed.

The proposed changes to § 72.212 are intended to require that general licensees perform appropriate load evaluations of cask storage pads and areas to ensure that casks are not placed in an unanalyzed condition. Similar requirements currently exist in § 72.102(c) for an ISFSI specific license and are proposed in § 72.103(c).

## **VII. Specific Question for Public Comment**

The Commission welcomes comments on all aspects of this proposed rule and is especially interested in receiving comments on the following question:

### Discussion:

The present mean annual probability of exceedance value for determining the DE for an ISFSI or MRS is approximately  $1.0\text{E-}04$  (i.e., in any one year, the probability is one in ten thousand, which is the reciprocal of  $1.0\text{E-}04$ , that the DE established for the site will be exceeded). This value is based on nuclear plant requirements. The Commission is considering allowing for the use of a mean annual probability of exceedance value in the range of  $5.0\text{E-}04$  (i.e., in any one year, the probability is one in two thousand that the DE established for the site will be exceeded) to  $1.0\text{E-}04$  for ISFSI or MRS applications. Draft Regulatory Guide DG-3021, "Site Evaluations and Determination of Design Earthquake Ground Motion for Seismic Design of Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations," listed in Section V, has been developed to provide guidelines that are acceptable to the NRC staff for determining the DE for an ISFSI or MRS. Currently, DG-3021 recommends a mean annual probability of exceedance value of  $5.0\text{E-}04$  as an appropriate risk-informed value for the design of a dry cask storage ISFSI or MRS. However, the NRC staff is undertaking further analysis to support a specific value. An ISFSI or MRS license applicant would need to demonstrate that the use of a higher probability of exceedance value would not impose any undue radiological risk to public health and safety.

### Question:

In view of this discussion and the discussion in Section IV.C., what is the appropriate mean annual probability of exceedance value to be used for the seismic design of an ISFSI or MRS and what is the justification for this probability?

## **VIII. Criminal Penalties**

For the purpose of Section 223 of the Atomic Energy Act (AEA), the Commission is proposing to amend 10 CFR Part 72 under one or more of sections 161b, 161i, or 161o of the AEA. Willful violations of the rule would be subject to criminal enforcement.

## **IX. Agreement State Compatibility**

Under the “Policy Statement on Adequacy and Compatibility of Agreement State Programs” approved by the Commission on June 30, 1997, and published in the Federal Register on September 3, 1997 (62 FR 46517), this rule is classified as Compatibility Category “NRC.” Compatibility is not required for Category “NRC” regulations. The NRC program elements in this category are those that relate directly to areas of regulation reserved to the NRC by the AEA of 1954, as amended, or the provisions of Title 10 of the Code of Federal Regulations. Although an Agreement State may not adopt program elements reserved to NRC, it may wish to inform its licensees of certain requirements via a mechanism that is consistent with the particular State’s administrative procedure laws, but does not confer regulatory authority on the State.

## **X. Plain Language**

The Presidential Memorandum dated June 1, 1998, entitled “Plain Language in Government Writing” directed that the Government’s writing be in plain language. The NRC requests comments on the proposed rule specifically with respect to the clarity and

effectiveness of the language used. Comments should be sent to the address listed under the heading “ADDRESSES” above.

## **XI. Voluntary Consensus Standards**

The National Technology Transfer Act of 1995 (Pub. L. 104-113) requires that Federal agencies use technical standards that are developed or adopted by voluntary consensus standards bodies unless the use of such a standard is inconsistent with applicable law or otherwise impractical. In this proposed rule, the NRC is presenting amendments to its regulations in 10 CFR Part 72 for the geological and seismological criteria of a dry cask independent spent fuel storage facility, to make them commensurate with the risk of the facility. This action does not constitute the establishment of a standard that establishes generally-applicable requirements.

## **XII. Finding of No Significant Environmental Impact: Availability**

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission’s regulations in Subpart A of 10 CFR Part 51, not to prepare an environmental impact statement for this proposed rule because the Commission has concluded, based on an Environmental Assessment, that this proposed rule, if adopted, would not be a major Federal action significantly affecting the quality of the human environment.

The Commission concluded that no significant environmental impact would result from this rulemaking. In comparison with a NPP, an operating ISFSI or MRS is a passive facility in

which the primary activities are waste receipt, handling, and storage. An ISFSI or MRS does not have the variety and complexity of active systems necessary to support an operating NPP. Once the spent fuel is in place, an ISFSI or MRS is essentially a static operation and, during normal operations, the conditions required for the release and dispersal of significant quantities of radioactive materials are not present. There are no high temperatures or pressures present during normal operations or under design basis accident conditions to cause the release and dispersal of radioactive materials. This is primarily due to the low heat generation rate of spent fuel after it has decayed for more than one year before storage in an ISFSI or MRS and the low inventory of volatile radioactive materials readily available for release to the environs. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. The short-lived volatile nuclides, such as I-131, are no longer present in aged spent fuel stored at an ISFSI or MRS. Furthermore, even if the short-lived nuclides were present during an event of a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the seismically induced radiological risk associated with an ISFSI or MRS is less than the risk associated with a NPP.

The determination of this environmental assessment is that there will be no significant environmental impact due to the proposed changes because the same level of safety would be maintained by the new requirements, taking into account the lesser risk from an ISFSI or MRS. However, the general public should note that the NRC welcomes public participation. Comments on any aspect of the Environmental Assessment may be submitted to the NRC as indicated under the ADDRESSES heading.

The NRC has sent a copy of the Environmental Assessment and this proposed rule to every State Liaison Officer and requested their comments on the Environmental Assessment.



The Environmental Assessment may be examined at the NRC Public Document Room, O-1F21, 11555 Rockville Pike, Rockville, MD. Single copies of the Environmental Assessment are available from Keith K. McDaniel, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, telephone: (301) 415-5252, e-mail: [kkm@nrc.gov](mailto:kkm@nrc.gov).

### **XIII. Paperwork Reduction Act Statement**

This proposed rule amends information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq). This proposed rule has been submitted to the Office of Management and Budget (OMB) for review and approval of the information collection requirements.

The burden to the public for these information collections is estimated to average 2,563 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. The U.S. Nuclear Regulatory Commission is seeking public comment on the potential impact of the information collections contained in the proposed rule and on the following issues:

1. Is the proposed information collection necessary for the proper performance of the functions of the NRC, including whether the information will have practical utility?
2. Is the estimate of burden accurate?
3. Is there a way to enhance the quality, utility, and clarity of the information to be collected?

4. How can the burden of the information collection be minimized, including the use of automated collection techniques?

Send comments on any aspect of these proposed information collections, including suggestions for reducing the burden, to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet electronic mail at INFOCOLLECTS@NRC.GOV; and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0132), Office of Management and Budget, Washington, DC 20503. Comments to OMB on the information collections or on the above issues should be submitted by **(insert date 30 days after publication in the Federal Register)**. Comments received after this date will be considered if it is practical to do so, but assurance of consideration cannot be given to comments received after this date.

#### Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

### **XIV. Regulatory Analysis**

The Commission has prepared a draft Regulatory Analysis (RA) entitled: "Regulatory Analysis of Geological and Seismological Characteristics for Design of Dry Cask Independent

Spent Fuel Storage Installations.” The RA examines the costs and benefits of the alternatives considered by the Commission.

The Commission requests public comment on the RA. Comments may be submitted to the NRC as indicated under the ADDRESSES heading. The RA is available on the NRC rulemaking website at <http://ruleforum.llnl.gov>, and is also available for inspection at the NRC Public Document Room located at One White Flint North, Room O-1F21, 11555 Rockville Pike, Rockville, MD. Single copies of the RA are available from Keith K. McDaniel, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, telephone: (301) 415-5252, e-mail: [kkm@nrc.gov](mailto:kkm@nrc.gov).

## **XV. Regulatory Flexibility Certification**

In accordance with the Regulatory Flexibility Act of 1980 (5 U.S.C. 605(b)), the Commission certifies that this proposed rule will not, if promulgated, have a significant economic impact on a substantial number of small entities. This proposed rule affects applicants for a Part 72 specific license, and general licensees on or after the effective date of the rule for an ISFSI or MRS. These companies do not generally fall within the scope of the definition of “small entities” set forth in the Regulatory Flexibility Act or the Small Business Size Standards set out in regulations issued by the Small Business Administration at 13 CFR Part 121.

## **XVI. Backfit Analysis**

The Commission has determined that the backfit rule, § 72.62, does not apply to the changes in § 72.9, § 72.102, and § 72.103 because they do not involve any provisions that would impose backfits as defined in § 72.62(a).

Section 72.212(b)(2)(i)(B) currently requires evaluations of static loads of the stored casks for design of the cask storage pads and areas (foundation). The proposed revisions to this section would require general licensees also to address the dynamic loads of the stored casks. During a seismic event, the cask storage pads and areas experience dynamic loads in addition to static loads. The dynamic loads depend on the interaction of the casks, cask storage pads, and areas. Consideration of the dynamic loads of the stored casks, in addition to the static loads, for the design of the cask storage pads and areas, would ensure that the cask storage pads and areas would perform satisfactorily during a seismic event.

The proposed revision would also require consideration of potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion. Depending on the properties of soil and structures, the free-field earthquake acceleration input loads may be amplified at the top of the storage pad. These amplified acceleration input values must be bound by the design bases seismic acceleration values for the cask, specified in the Certificate of Compliance (CoC). The soil liquefaction and instability during a vibratory motion due to an earthquake event may affect the cask stability.

The proposed changes to § 72.212(b)(2)(i)(B) will impact procedures required to operate an ISFSI and; therefore, implicate the backfit rule. The proposed changes would require that general licensees perform appropriate analyses to assure that the cask seismic

design bases bound the specific site seismic conditions, and that casks are not placed in an unanalyzed condition. Therefore, these proposed changes are necessary to assure adequate protection to occupational or public health and safety. Although the Commission is imposing this backfit because it is necessary to assure adequate protection to occupational or public health and safety, the proposed changes to § 72.212 would not actually impose new burden on the general licensees because they currently need to consider dynamic loads to meet the requirements in § 72.212(b)(2)(i)(A). Section 72.212(b)(2)(i)(A) requires that general licensees perform written evaluations to meet conditions set forth in the cask CoC. These CoCs require that dynamic loads, such as seismic and tornado loads, be evaluated to meet the cask design bases. Since the general licensees currently evaluate dynamic loads for evaluating the casks, pads and areas, the proposed changes to § 72.212(b)(2)(i)(B) would not actually require any general licensees presently operating an ISFSI to re-perform any written evaluations previously undertaken.

### **List of Subjects In 10 CFR Part 72**

Administrative practice and procedure, Criminal penalties, Manpower training programs, Nuclear materials, Occupational safety and health, Penalties, Radiation protection, Reporting and recordkeeping requirements, Security measures, Spent fuel, Whistleblowing.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and 5 U.S.C. 553; the NRC is proposing to adopt the following amendments to 10 CFR Part 72.

**PART 72—LICENSING REQUIREMENTS FOR THE INDEPENDENT STORAGE OF SPENT  
NUCLEAR FUEL, HIGH-LEVEL RADIOACTIVE WASTE, AND REACTOR-RELATED  
GREATER THAN CLASS C WASTE**

1. The authority citation for Part 72 continues to read as follows:

Authority: Secs. 51, 53, 57, 62, 63, 65, 69, 81, 161, 182, 183, 184, 186, 187, 189, 68 Stat. 929, 930, 932, 933, 934, 935, 948, 953, 954, 955, as amended, sec. 234, 83 Stat. 444, as amended (42 U.S.C. 2071, 2073, 2077, 2092, 2093, 2095, 2099, 2111, 2201, 2232, 2233, 2234, 2236, 2237, 2238, 2282); sec. 274, Pub. L. 86-373, 73 Stat. 688, as amended (42 U.S.C. 2021); sec. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846); Pub. L. 95-601, sec. 10, 92 Stat. 2951 as amended by Pub. L. 102-486, sec. 7902, 106 Stat. 3123 (42 U.S.C. 5851); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332); secs. 131, 132, 133, 135, 137, 141, Pub. L. 97-425, 96 Stat. 2229, 2230, 2232, 2241, sec. 148, Pub. L. 100-203, 101 Stat. 1330-235 (42 U.S.C. 10151, 10152, 10153, 10155, 10157, 10161, 10168).

Section 72.44(g) also issued under secs. 142(b) and 148(c), (d), Pub. L. 100-203, 101 Stat. 1330-232, 1330-236 (42 U.S.C. 10162(b), 10168(c),(d)). Section 72.46 also issued under sec. 189, 68 Stat. 955 (42 U.S.C. 2239); sec. 134, Pub. L. 97-425, 96 Stat. 2230 (42 U.S.C. 10154). Section 72.96(d) also issued under sec. 145(g), Pub. L. 100-203, 101 Stat. 1330-235 (42 U.S.C. 10165(g)). Subpart J also issued under secs. 2(2), 2(15), 2(19), 117(a), 141(h), Pub. L. 97-425, 96 Stat. 2202, 2203, 2204, 2222, 2224, (42 U.S.C. 10101, 10137(a), 10161(h)). Subparts K and L are also issued under sec. 133, 98 Stat. 2230 (42 U.S.C. 10153) and sec. 218(a), 96 Stat. 2252 (42 U.S.C. 10198).

2. In § 72.9, paragraph (b) is revised to read as follows:

§ 72.9 Information collection requirements: OMB approval.

(b) The approved information collection requirements contained in this part appear in §§ 72.7, 72.11, 72.16, 72.22 through 72.34, 72.42, 72.44, 72.48 through 72.56, 72.62, 72.70, through 72.82, 72.90, 72.92, 72.94, 72.98, 72.100, 72.102, 72.103, 72.104, 72.108, 72.120, 72.126, 72.140 through 72.176, 72.180 through 72.186, 72.192, 72.206, 72.212, 72.216, 72.218, 72.230, 72.232, 72.234, 72.236, 72.240, 72.242, 72.244, 72.248.

3. The heading of § 72.102 is revised to read as follows:

§ 72.102 Geological and seismological characteristics for applications before **[insert Effective Date of the Rule]** and applications for other than dry cask modes of storage.

\* \* \* \* \*

4. A new § 72.103 is added to read as follows:

§ 72.103 Geological and seismological characteristics for applications for dry cask modes of storage on or after **[insert Effective Date of the Rule]**.

(a)(1) East of the Rocky Mountain Front (east of approximately 104° west longitude), except in areas of known seismic activity including but not limited to the regions around New Madrid, MO, Charleston, SC, Attica, NY will be acceptable if the results from onsite foundation and geological investigation, literature review, and regional geological reconnaissance show no unstable geological characteristics, soil stability problems, or potential for vibratory ground motion at the site in excess of an appropriate response spectrum anchored at 0.2 g.

(2) For those sites that have been evaluated under paragraph (a)(1) of this section that are east of the Rocky Mountain Front, and that are not in areas of known seismic activity, a standardized design earthquake ground motion (DE) described by an appropriate response spectrum anchored at 0.25 g may be used. Alternatively, a site-specific DE may be

determined by using the criteria and level of investigations required by paragraph (f) of this section. For a site with a co-located nuclear power plant (NPP), the existing geological and seismological design criteria for the NPP may be used. If the existing design criteria for the NPP is used and the site has multiple NPPs, then the criteria for the most recent NPP must be used.

(b) West of the Rocky Mountain Front (west of approximately 104° west longitude), and in other areas of known potential seismic activity east of the Rocky Mountain Front, seismicity must be evaluated by the techniques presented in paragraph (f) of this section. Sites that lie within the range of strong near-field ground motion from historical earthquakes on large capable faults should be avoided. If an ISFSI or MRS is located on a NPP site, the existing geological and seismological design criteria for the NPP may be used. If the existing design criteria for the NPP is used and the site has multiple NPPs, then the criteria for the most recent NPP must be used.

(c) Sites other than bedrock sites must be evaluated for their liquefaction potential or other soil instability due to vibratory ground motion.

(d) Site-specific investigations and laboratory analyses must show that soil conditions are adequate for the proposed foundation loading.

(e) In an evaluation of alternative sites, those which require a minimum of engineered provisions to correct site deficiencies are preferred. Sites with unstable geologic characteristics should be avoided.

(f) The DE for use in the design of structures, systems, and components must be determined as follows:

(1) *Geological, seismological, and engineering characteristics.* The geological, seismological, and engineering characteristics of a site and its environs must be investigated



in sufficient scope and detail to permit an adequate evaluation of the proposed site, to provide sufficient information to support evaluations performed to arrive at estimates of the DE, and to permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site. The size of the region to be investigated and the type of data pertinent to the investigations must be determined based on the nature of the region surrounding the proposed site. Data on the vibratory ground motion, tectonic surface deformation, nontectonic deformation, earthquake recurrence rates, fault geometry and slip rates, site foundation material, and seismically induced floods and water waves must be obtained by reviewing pertinent literature and carrying out field investigations. However, each applicant shall investigate all geologic and seismic factors (for example, volcanic activity) that may affect the design and operation of the proposed ISFSI or MRS facility irrespective of whether these factors are explicitly included in this section.

(2) *Geologic and seismic siting factors.* The geologic and seismic siting factors considered for design must include a determination of the DE for the site, the potential for surface tectonic and nontectonic deformations, the design bases for seismically induced floods and water waves, and other design conditions as stated in paragraph (f)(2)(iv) of this section.

(i) *Determination of the Design Earthquake Ground Motion (DE).* The DE for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface. In view of the limited data available on vibratory ground motions for strong earthquakes, it usually will be appropriate that the design response spectra be smoothed spectra. The DE for the site is determined considering the results of the investigations required by paragraph (f)(1) of this section. Uncertainties are inherent in these estimates and must be addressed through an appropriate analysis, such as a probabilistic seismic hazard analysis (PSHA) or suitable sensitivity analyses.

(ii) *Determination of the potential for surface tectonic and nontectonic deformations.*

Sufficient geological, seismological, and geophysical data must be provided to clearly establish if there is a potential for surface deformation.

(iii) *Determination of design bases for seismically induced floods and water waves.* The size of seismically induced floods and water waves that could affect a site from either locally or distantly generated seismic activity must be determined.

(iv) *Determination of siting factors for other design conditions.* Siting factors for other design conditions that must be evaluated include soil and rock stability, liquefaction potential, and natural and artificial slope stability. Each applicant shall evaluate all siting factors and potential causes of failure, such as, the physical properties of the materials underlying the site, ground disruption, and the effects of vibratory ground motion that may affect the design and operation of the proposed ISFSI or MRS.

(3) Regardless of the results of the investigations anywhere in the continental U.S., the DE must have a value for the horizontal ground motion of no less than 0.10 g with the appropriate response spectrum.

5. In § 72.212, paragraph (b)(2)(i)(B) is revised to read as follows:

§ 72.212 Conditions of general license issued under § 72.210.

	*	*	*	*	*
(b)	*	*	*		
(2)	*	*	*		
(i)	*	*	*		

(B) cask storage pads and areas have been designed to adequately support the static

and dynamic loads of the stored casks, considering potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion; and

\* \* \* \* \*

Dated at Rockville, Maryland, this \_\_\_\_\_ day of \_\_\_\_\_, 2002.

For the Nuclear Regulatory Commission.

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Annette L. Vietti-Cook,  
Secretary for the Commission.